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TRANSMITTAL OF APPEAL BRIEF (Large Entity)

Docket No. KOT-0014

In Re Application Of: **Chika Honda et al.**

Serial No.	Filing Date	Examiner	Group Art Unit
09/616,608	07/14/2000	Craig E. Church	2882

Invention: **X-RAY IMAGE RADIOGRAPHING METHOD AND RADIOGRAPHING APPARATUS**

TO THE COMMISSIONER FOR PATENTS:

Transmitted herewith in triplicate is the Appeal Brief in this application, with respect to the Notice of Appeal filed on **June 14, 2004**

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Signature

Dated: **August 10, 2004**

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

APPELLANT:	Chika Honda, et al.	) Group Art Unit: 2882
SERIAL NUMBER:	09/616,608	) Before the Examiner:
FILED:	July 14, 2000	) Craig E. Church
FOR:	X-RAY IMAGE RADIOGRAPHING METHOD AND RADIOGRAPHING APPARATUS	)

APPEAL BRIEF

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1. THE REAL PARTY IN INTEREST

The Real party in interest in this appeal is Konica Corporation. Ownership by Konica Corporation is established by assignment document recorded for this application on July 14, 2000 on Reel 010965 Frame 0862.

2. RELATED APPEALS AND INTERFERENCES

Appellant knows of no related patent applications or patents under any appeal or interference proceeding.

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Signature Date

3. STATUS OF CLAIMS

Currently, claims 2, 5-11 and 26 are pending. All pending claims stand rejected under 35 U.S.C. § 103(a).

4. STATUS OF AMENDMENTS

There have been no amendments filed subsequent to receipt of the final office action.

5. SUMMARY OF INVENTION

Referring to Figures 1-7 of the application, the invention relates to a method for providing phase contrast X ray radiographs. In order to understand the invention, some background information may be helpful.

X-rays have the nature of a wave, and therefore exhibit many wave properties. For example, as X-rays pass through a substance, refraction of the wave may occur. This refraction can be detected as an image on the radiograph. Submitting the X-ray image to high contrast radiography provides a phase contrast X-ray image. The contrast at a boundary region, or edge, of the object may be enhanced, thus increasing the diagnostic ability of the X-ray image. Therefore, producing edge enhanced phase contrast X-ray images at a clinical facility would benefit medical service and industry. Specification page 2, lines 11-13.

However, a typical method for obtaining phase contrast images are insufficient for actual use at a working spot where an image is obtained. Specification page 2, lines 21-23. For example, phase contrast X-ray images may be provided by synchrotron radiation using large, space consuming equipment, or by micro focus X-ray tubes having a point shaped light source (focal spot size about 20 μm), which may take hours to produce an image on film. In contrast, clinical radiography machines, while space and time efficient, generally have a focal spot size greater than 20 μm, which can result in penumbra, or blurring, of the image, particularly loss of sharpness at the edge.

This invention relates to a method for providing phase contrast X-ray images in clinical radiography such as mammography. In particular, referring to Figure 1, there is a fixing means 4 to fix the respective positions of an of an X-ray tube 1, an object to be radiographed and an X-ray detector 3. The distance between the X-ray tube 1 and the object is R1 and the distance between the object and the X-ray detector 3 is R2. The size of the focal spot of the X-ray tube is represented as D. It should also be noted that while the fixing means 4 may be shown as being at the X-ray detector 3 side of the object, it may also be located on the X-ray tube 1 side. See Specification page 10 lines 16-24; page 11, line 20.

An exemplary embodiment of the method includes an X-ray image radiographing method of radiographing an object of a breast that includes using an X-ray tube having a size D of focal spot defined by the following formula $100\ \mu m \leq D \leq 600\ \mu m$. The distance R1 is set between the X-ray tube and an object of a breast so as to be within a range defined by the following formula $(D-7)/200\ m \leq R1 \leq 5\ m$. In addition, the distance R2 is set between the object and an X-ray detector so as to be within a range defined by the following formula $0.15\ m \leq R2 \leq 1.4\ m$. This allows for the production of a high contrast image using an X ray tube generally usable at a medical facility. Specification page 11, lines 1-3. In particular, an exemplary embodiment of the invention enhances the edge of the image so as to make the edge more sharp without using the synchrotron radiator that needs a large scale apparatus or a X-ray light source whose X-ray focal spot size is small to be deemed as a point-shaped light source. In addition, by fixing an object at a R1 range from the X ray tube, the effect of edge enhancement is obtained at a working area where the image is used for medical services.

6. ISSUES

There is one issue on appeal, which is whether the Examiner's rejection of claims 2, 5-11 and 26 under 35 U.S.C. § 103(a) as being unpatentable over Wolbarst (Physics of Radiology, pages 196-122) ("Wolbarst") in view of Coe (U.S. 5,305,365) ("Coe") is improper.

7. GROUPING OF CLAIMS

There is one group of claims. The pending Claims 2, 5-11 and 26 comprise the first group, which stand or fall together, under the Examiner's contested rejection of these claims under 35 U.S.C. § 103(a) as being unpatentable over Wolbarst in view of Coe.

8. ARGUMENT

A. Claims 2, 5-11 and 26 are patentable under 35 U.S.C. § 103(a).

Under the first grouping of claims, the Examiner improperly rejected claims 2, 5-11, and 26 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Wolbarst in view of Coe. For an obviousness rejection to be proper, the Examiner must meet the burden of establishing that all elements of the invention are disclosed in the prior art; that the prior art relied upon, coupled with knowledge generally available in the art at the time of the invention, must contain some suggestion or incentive that would have motivated the skilled artisan to modify a reference or combined references; and that the proposed modification of the prior art must have had a reasonable expectation of success, determined from the vantage point of the skilled artisan at the time the invention was made. *In re Fine*, 5 U.S.P.Q.2d 1596, 1598 (Fed. Cir. 1988); *In Re Wilson*, 165 U.S.P.Q. 494, 496 (C.C.P.A. 1970).

Claims 2, 5-11, and 26 include the following element: "setting a distance R1 between the X-ray tube and an object of a breast so as to be within a range defined by the following formula: (D-7)/200 m $\leq$R1 $\leq$5 m." D is the focal spot and R1 is distance between the X-ray tube (source) and an object. The claims also define the focal spot D as follows: 100 μm (0.1 mm) $\leq$D $\leq$600 μm (0.6mm). When using the formula the focal spot in microns (μm) is used. In addition, the claims also include that R2, which is the distance between the object and the X-ray detector (image), is 0.15 m $\leq$R2 $\leq$ 1.4 m. When R2 is larger than 0.15 m, the radiophotography becomes an enlarging radiophotography having a magnification ratio of MR = (R1+R2)/R1. Thus, when R2 is 0, there is no magnification.

Also, for clarity, when the Examiner discusses "source-to-image" in the rejection, this is the distance between the X-ray tube (source) and the X-ray detector (image), which equals R1 + R2. It is important to note that in all of the cited references, there is no reference that discusses either R1 or R2 separately. Rather, the cited references only discuss the total distance of R1 and R2.

In particular, the Examiner asserts that Wolbarst teaches a focal spot of 0.1 (page 197) and a minimum source-to-image distance of 40 cm (page 202). The Examiner asserts that Coe teaches a source-to-image distance (R1 + R2) of 76 cm, and with a magnification of 1.5 as recommended by Wolbarst (page 221), the source-to-object (R1) distance would be 50 cm. The Examiner concludes: "It is obvious that applicant's claims read on the Wolbarst mammography with a focal spot size of 0.1 mm (100 microns), source-to-image distance of 76 cm and a source-to-object distance of 50 cm." In other words, the Examiner uses Wolbarst's focal spot, Wolbarst's magnification, and Coe's (R1+R2) total to calculate an R1, using Appellant's formula.

The first issue is whether the combination of Wolbarst and Coe is improper under 35 U.S.C. § 103(a). The second issue is whether the proposed modification of the prior art has a reasonable expectation of success. Finally, the third issue is whether all of the elements contained in these claims are disclosed by the prior art.

1. Wolbarst and Coe may not be combined to reach the invention of Claims 2, 5-11 and 26.

The combination of Wolbarst and Coe is improper. Obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988); *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992); MPEP § 2143.01.

In this case, there is no motivation to combine the references and in fact, the teachings of Coe specifically teach away from combining its teachings with Wolbarst.

Wobarst teaches that the R1+R2 distance is 40 cm and a magnification of 1.5 with a focal spot size of 0.1 mm; however, Wolbarst teaches nothing about a source-to-object distance. In addition, when plugging these numbers into Appellant's formula, an improper R1 distance is calculated. Thus, when using the Wolbarst parameters, the claimed invention is not met. Thus, the Examiner must look to another reference to plug in a different R1 distance. However, the Examiner was not able to find any reference that taught the R1 distance.

Instead, the Examiner found the Coe reference that again only teaches a R1 + R2 distance of 76 cm. Coe does not teach about a focal spot size or a separate R1 distance. In addition, Coe expressly teaches that there is no magnification and thus, the R2 distance is 0. As disclosed at column 5, lines 16-17 and column 6, lines 38-39, Coe teaches that the patient is caused to lean forwardly for placement of her breast on the titled film receptor. That is, Coe expressly teaches an object-to-detector distance (R2) of 0 cm, which means that Coe teaches that a mammography is to be operated with a magnification of 1.0, which means that R2 must be 0. As such, in Coe, because the R2 distance is 0, the R1 distance (or source-to-object) would have to be 76 cm and could not combined with any other reference to teach that R1 could be 50 cm, as suggested by the Examiner. There is nothing in Coe that suggests any other object-to-detector distance or magnification. While the Examiner wants to use the 76 cm for the R1 + R2 distance and plug that into Wolbarst, one skilled in the art would not have made that substitution, as there is nothing to indicate that the 76 cm of Coe can be used in Wolbarst. Moreover, Coe expressly teaches that the combined R1 + R2 distance of 76 cm is really a R1 distance of 76 cm since there is no magnification and R2 is 0. Accordingly, it would not have been obvious for an ordinarily skilled person in the art to combine Wolbarst and Coe to reach the claimed invention.

Furthermore, Wolbarst teaches on page 221 to use two focal spots of 0.4 mm for normal mammography and 0.1 mm for magnification mammography by a factor of 1.5 or 2. However, there is nothing in Coe that teaches or suggest about a focal spot and magnification mammography. That is, as shown in Figure 1 of Coe, Coe merely teaches normal mammography and teaches nothing about a structure to conduct magnification

mammography. As such, there is no motivation to combine the 0.1 mm of Wolbarst with Coe. Accordingly, it would not have been obvious for an ordinarily skilled person in the art to combine Wolbarst and Coe so as to conduct magnification mammography in the apparatus of Coe. As such, there is no motivation to combine Wolbarst and Coe.

Appellant maintains that the Examiner has used an improper standard in arriving at the rejection of the above claims. In applying Section 103, the U.S. Court of Appeals for the Federal Circuit has consistently held that one must consider both the invention and the prior art "as a whole," not from improper hindsight gained from consideration of the claimed invention. *See Interconnect Planning Corp. v. Feil,* 227 U.S.P.Q. 543, 551 (Fed. Cir. 1985) and cases cited therein. According to the *Interconnect* court

> "[n]ot only must the claimed invention as a whole be evaluated, but so also must the references as a whole, so that their teachings are applied in the context of their significance to a technician at the time - a technician without our knowledge of the solution." *Id.*

In this case, the Examiner has plucked certain teachings from two separate references and states that because he has found all of the parameters of Appellant's formula that the two references teach the invention. Appellant respectfully traverses.

As explained above, the Examiner has not found any reference that actually teaches setting a R1 distance (which is based on the focal spot) and setting a R2 distance. Instead, all of the references teach the total R1 and R2 distance. The Examiner then uses the Appellant's specification to figure out how to combine the two references to reach all of the parameters. One skilled in the art would not have known how to combine the two references to reach the claimed invention. Instead, the Examiner has used improper hindsight and has used Appellant's disclosure that provides the necessary teaching. It is improper for the Examiner to use Appellant's specification as a road map to reject the claims. Thus, the claims are patentable over Wolbarst and Coe.

2. Wolbarst and Coe, either alone or in combination, do not provide the suggestion or expectation of success to modify the prior art.

The requirement for a determination of obviousness is that "both the suggestion and the expectation of success must be founded in the prior art, not in applicant's disclosure." *In re Dow Chem.*, 837 F.2d 469, 473, 5 U.S.P.Q.2d 1529, 1531 (Fed. Cir. 1988) (emphasis supplied). An Examiner thus cannot base a determination of obviousness on what the skilled person in the art might try or find obvious to try. Rather, the proper test requires determining what the prior art would have led the skilled person to do, with a reasonable expectation of success.

In this case, none of the references teaches that there can be success with magnification mammography. In Coe, there is no teaching of magnification mammography. In Wolbarst, the reference teaches magnification mammography by a factor of 1.5 or 2 for a more detailed examination of microcalcifications. See page 221, right column lines 20-25. However, Wolbarst also explicitly teaches that the unsharpness of the image due to penumbra increases as the magnification of magnification mammography increases. See Figure 22-11 on page 197.

As explained in the Honda Declaration, with magnification mammography of the present invention, edge portions of contours of the objects of the Inventive example becomes clearer because there is a higher sharpness than the Comparative Example. In particular, the Declaration showed the differences between Appellant's present invention and the references by submission of Comparative example I, which represents Coe, Comparative example II, which represents the combination of Wolbarst and Coe (which assumes that these two references can be combined, however, Appellant continues to maintain that they cannot be combined), and Inventive example, which represents the an embodiment of the present invention.

As stated in the Test results, by magnification radiography, a more detailed examination of the x-ray can be conducted in Comparative example II than Comparative example I; however, as Wolbarst explicitly teaches, the unsharpness of image due to penumbra increases in Comparative example II.

In contrast, with the radiographing method of an embodiment of the present invention, edge portions of contours of the objects in the Inventive example becomes clearer because there is a higher sharpness than Comparative example II. See the Declaration.

Accordingly, for this additional reason, claims 2, 5-11, and 26 are patentable over Wolbarst and Coe.

3. Claims 2, 5-11 and 26 include limitations not taught or suggested by Wolbarst or Coe either alone or in combination.

Claims 2, 5-11, and 26 include the following limitation: "setting a distance R1 between the X-ray tube and an object of a breast so as to be within a range defined by the following formula: $(D-7)/200\ m \leq R1 \leq 5\ m$." Accordingly, setting a distance R1 as defined by a formula that requires the source-to-object distance to be based on the focal spot size D.

There is nothing in Wolbarst that teaches or suggests how to determine the distance of R1. Wolbarst merely teaches the total R1 + R2 distance is 40 cm. Moreover Coe also merely teaches the total R1 + R2 distance is 76 cm and teaches nothing about the size of a focal spot of the x-ray tube and about how to determine the distance R1. Thus, even if Wolbarst and Coe are combined, there is no reference that teaches setting the R1 distance or the focal spot D.

In addition, the Examiner asserts that as long as Wolbarst and Coe define a set of parameters that satisfies the formula, then the claims must be rejected. However, the Examiner has not found two references that define the set of parameters because there is nothing in Wolbarst or Coe that teach about the source to object distance of 50 cm. As explained above, because Coe requires R2 to be 0, R1 must be 76 cm and cannot be 50 cm. Thus, there is no reference that teaches the R1 distance.

Thus, even if Wolbarst and Coe are combined, which they cannot be, the combination of Wolbarst and Coe do not teach or suggest all of the limitations of claims 2,

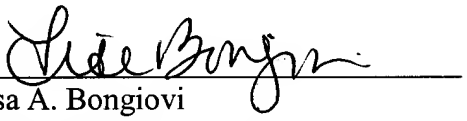
5-11, and 26. Accordingly, Appellant respectfully submits that the rejection of claims 2, 5-11 and 26 under 35 U.S.C. § 103(a) was improper.

B. Conclusion

For the reasons cited above, Appellant respectfully submits that the rejections are improper and request reversal of the outstanding rejections. If there are any additional charges with respect to this Appeal, or otherwise, please charge them to Deposit Account No. 06-1130 maintained by Appellant's attorneys.

Respectfully submitted,

CANTOR COLBURN LLP
Appellant's attorneys

By: 
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9. APPENDIX A

Appealed Claims

2. An X-ray image radiographing method of radiographing an object of a breast, comprising using an X-ray tube having a size D of focal spot defined by the following formula:

$$100\ \mu m \leq D \leq 600\ \mu m;$$

setting a distance R1 between the X-ray tube and an object of a breast so as to be within a range defined by the following formula:

$$(D\text{-}7)/200\ m \leq R1 \leq 5\ m;\ \text{and}$$

setting a distance R2 between the object and an X-ray detector so as to be within a range defined by the following formula:

$$0.15\ m \leq R2 \leq 1.4\ m.$$

5. The X-ray image radiographing method of claim 2, wherein the size of focal spot is 50 μm to 500 μm.

6. The X-ray image radiographing method of claim 2, wherein the energy of X-ray in a line spectrum is 10 keV to 60 keV.

7. The X-ray image radiographing method of claim 2, wherein an anode of the X-ray tube contains molybdenum or rhodium.

8. The X-ray image radiographing method of claim 2, wherein a screen/film system having an image contrast $\bar{G}$ of 1.5 to 3.6 is used.

9. The X-ray image radiographing method of claim 2, wherein a screen/film system having an image contrast $\bar{G}$ of 1.5 to 4.0 is used.

10. The X-ray image radiographing method of claim 2, wherein a digital X-ray detector having a size of a pixel of 1 μm to 200 μm is used.

11. The X-ray image radiographing method of claim 10, wherein an enhanced boundary portion of the object is detected from the obtained image data and a width of the boundary portion and/or image contrast is further enhanced.

26. The X-ray image radiographing method of claim 2, wherein the distance R1 satisfies the following formula:

$$0.7\ \text{m} \leq R1 \leq 5\ \text{m}.$$